Remarks

In the aforementioned amendment, claims 3, 6, 10, 14, 15 and 19-20 have been amended. Pending in the application are claims 1-22 of which claims 1, 4, 7, 11, and 16 are independent. The following comments address all stated grounds of rejection. Applicants respectfully urge the Examiner to pass the claims to allowance in view of the remarks set forth below.

Claim Amendments

Claims 3, 6, 10, 14, 15 and 19-20 have been amended to clarify the scope of the claimed invention. Applicants have amended claims 3, 6, 10, 14, 15 and 19-20 to change "adapted to use" to --adapted to position--. In light of the claim amendments, Applicants submit that the claimed invention recites a function that the claimed VCSEL operates in high speed communication link or in applications of 1.2 Gb/s and 2.5 Gb/s frequencies.

Claim Rejections-35 U.S.C §112

Claims 3, 6, 10, 14, 15, 19 and 20 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. The Examiner indicates that it is unclear what further structural limitations are being implied by that recitation of intended use.

Applicants respectfully submit that the claimed invention recites a functional limitation that the VCSEL is adapted to position in high speed communication links over a multimode fiber or in applications of 1.2 Gb/s and 2.5 Gb/s frequencies. The functional limitation defines claims by what it does rather than what it is. Applicants can describe some parts of the claims in functional terms. Functional language does not, in and of itself, render a claim improper. *In re Swinehart*, 439 F.2d 210, 169 USPQ 226 (CCPA 1971).

The Examiner appears to believe that the structural limitations should be implied in the claims. Applicants submit that "a functional limitation must be evaluated and considered, just like any other limitation of the claim, for what it fairly conveys to a person of ordinary skill in the pertinent art in the context in which it is used." MPEP 2173.05(g). The limitation recited in the claimed invention should be evaluated and considered without implying structural limitations as long as the person of ordinary skill in the art appreciates. In lie of the arguments, Applicants submit that claims 3, 6, 10, 14, 15, 19 and 20 are in condition for allowance.

Claim Rejections-35 U.S.C. §102

Claims 1-4, 6 and 22 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,287,366 to Epworth et al. (the Epworth reference). Applicants respectfully traverse this rejection.

The claimed invention relates to a vertical cavity surface emitting laser (VCSEL). The claimed invention recites a stabilizer module for stabilizing modal gains of the multiple modes of the VCSEL by increasing current through the contact region.

With respect to Applicants' first argument that the Epworh reference fails to disclose a VCSEL, the Examiner asserts that the VCSEL in claims 1-4 and 6 requires only an active region, a contact region and a stabilization module, and that the Epworth reference teaches all the claimed features and therefore anticipates the claimed invention. Applicants respectfully disagree.

Applicants claim a VCSEL that comprises an active region, a contact region and a stabilization module. The transition phrase 'comprising' in the claims makes the body of the claims open, which means that the claims do not exclude additional, unrecited elements in the body of the claims. *Moleculon Research Corp. v. CBS, Inc.*, 193 F.2d 1261, 229 USPQ 805 (Fed. 1986), *Cert. denied*, 479 U.S. 1030 (1987). Therefore, the claimed invention is not limited only to an active region, a contact region and a stabilization module.

Applicants also submit that the Epworth reference should disclose each and every limitations of the claimed invention to anticipate the claimed invention. *Apple Computer, Inc. v. Articulate Systems, Inc.*, 234 F.3d 14, 57 USPQ2d 1057 (Fed. Cir. 2000). The claimed invention clearly recites a VCSEL. The Epworth reference however discloses an injection laser diode but not the VCSEL. Therefore, Applicants submit that the Epworth reference does not anticipate the claimed invention.

With respect to Applicants' second argument that the Epworth reference does not disclose increasing of bias current to stabilize modal gains of the VCSEL, the Examiner asserts that the Epworth reference teaches at column 6, lines 63-65 that the modal stabilization occurs with laser bias adjustment. The Examiner further asserts that since it is not limited to decreasing laser bias only, Epworth does not exclude increasing laser bias in its discussion of laser bias adjustment relating to modal stabilization. Applicants respectfully disagree.

Applicants note that the Epworth reference discloses in Fig. 5 that the coherence characteristics are more stabilized by decreasing the drive current. Furthermore, the Epworth reference discloses at column 6, lines 54-59 that the modulation depth is reduced when the laser spectral properties degrade excessively. The modulation depth i_m is defined as the difference between the data '1' bit drive current i_1 and the data '0' bit drive current i_0. The bias current equals to $(i_0 + i_1)/2$ which is the same as $i_0 + i_m/2$. The reduction of modulation depth i_m leads to the decreasing of the bias current. The Epworth reference does not disclose increasing of the bias current to stabilize the spectral quality of the laser. Therefore, Applicants submit that the adjustment of the drive current to stabilize the spectral quality of the laser in the Epworth reference is limited to the decreasing or reduction of the drive current.

With respect to Applicants' third argument that the Epworth reference fails to disclose the stabilizer module for stabilizing modal gains of the multiple modes of the

VCSEL, the Examiner asserts that this limitation is addressed at column 6 line36 through column 7, line 10. Applicants respectfully disagree.

The Epworth reference discloses in Fig. 6 the shape of the coherence characteristics for multilongitudinal mode output. The coherence characteristic is an alternative measure of the spectral quality of the laser emission (column 4, lines 40-42). The Epworth discloses that the spectral quality, such as the coherence characteristic, is stabilized by adjusting the laser bias. The Epworth reference, however, does not disclose any relation between the coherence characteristic and modal gains of multiple modes of the laser. The Epworth reference does not disclose that the spectral quality includes modal gains of multiple modes of the laser. Applicants therefore submit that the Epworth reference does not disclose the stabilization of modal gains of multiple modes of the laser.

In light of the aforementioned arguments, Applicants respectfully submit that the Epworth reference fails to disclose all of the essential elements of claims 1-4 and 6. Applicants therefore believe that claims 1-4 and 6 are in condition for allowance.

Claim Rejections-35 U.S.C. §103

Claims 5 and 7-21 are rejected under 35 U.S.C. §103(a) as being unpatentable over the Epworth reference and further in view of Applicants' Admitted Prior Art (APA). Applicants respectfully traverse this rejection.

Applicants submit that the Epworth reference and APA fail to teach or suggest all of the limitations of claims 1, 7, 11, and 16. The Epworth reference and APA fail to teach or suggest stabilizing modal gains of the multiple modes of the VCSEL by increasing bias current through the contact region, as recited in the claimed invention.

The Examiner asserts that the combination of the teachings in the Epworth reference and the disclosure of the VCSEL in the Background portion of the pending application (APA) lead to the claimed invention. Applicants respectfully disagree. The Epworth reference only teaches decreasing of bias current of an injection laser to stabilize the coherence characteristic of the laser in FIGURE 5. In particular, the Epworth reference teaches at column 6, lines 54-59 the reduction of the modulation depth (modulation current) when the laser properties degrade excessively. As mentioned above, the reduction of modulation depth leads to the decreasing of the bias current. Therefore, the Epworth reference teaches decreasing or reduction of bias current not increasing of the bias current to stabilize modal gains. If the teachings in the Epworth reference are combined with the disclosure of the APA, the resultant combination could be a VCSEL in which a bias current is reduced or decreased to stabilize the spectral quality of the VCSEL.

Furthermore, a VCSEL has a large ohmic resistance that generates a relatively higher level of heat than other types of lasers. This structural limitation of the VCSEL requires an efficient cooling system and increasing of the bias current makes it more difficult to cool the heat generated in the VCSEL. For this reason, those of ordinary skill in the art will not be motivated to increase the bias current to stabilize the modal gains of

the multiple modes of the VCSEL. In lieu of this, Applicants submit that the claimed invention is not obvious to those of skill in the art.

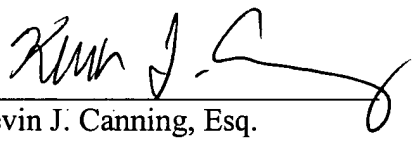
In light of the aforementioned arguments, Applicants respectfully submit that the Epworth reference and APA fail to teach or suggest all of the claim limitations of claims 1, 7, 11, and 16. Claims 5, 8-10, 12-15 and 17-21, which depend on one of claims 1, 7, 11 and 16, are not rendered obvious over the Epworth reference and APA. Applicants therefore submit that claims 5 and 7-21 are in condition for allowance.

Conclusion

In light of the aforementioned arguments, Applicants contend that each of the Examiners rejections has been adequately addressed and the pending application is in condition for allowance. Should the examiner feel that a telephone conference with Applicants' attorney would expedite prosecution of this application, the Examiner is urged to contact the Applicants' attorney at (617) 227-7400.

Respectfully submitted,

LAHIVE & COCKFIELD, LLP



Kevin J. Canning, Esq.
Registration No. 35,470
Attorney for Applicants

28 State Street
Boston, MA 02109
(617) 227-7400

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